CLAIMS:

1. A drill, comprising:

a tubular outer housing having a bore extending along a longitudinal axis;

a tubular inner housing mounted in the bore for reciprocal movement along the axis between retracted and extended positions;

a pneumatic motor assembly having a chuck adapted to receive a drill bit for rotation therewith, the motor assembly being carried in the inner housing for axial movement therewith; and

an annular pneumatic cylinder between the inner housing and the outer housing for supplying pressure to move the inner housing between the retracted and extended positions.

2. The drill according to claim 1, further comprising:

a sealed annular fluid restrictor located between the inner housing and the outer housing for containing a hydraulic fluid for controlling a rate of axial movement of the inner housing relative to the outer housing.

3. The drill according to claim 1, further comprising:

an annular forward piston mounted to the inner housing for axial movement therewith and in sealing engagement with the bore of the outer housing;

a stationary seal fixed to the outer housing, sealingly engaging the inner housing and located rearward of the forward piston, defining an annular forward restrictor chamber therebetween for containing hydraulic fluid;

an annular intermediate piston mounted to the inner housing for axial movement therewith, sealingly engaging the bore of the outer housing and located rearward of the stationary seal, defining a rearward restrictor chamber therebetween for containing hydraulic fluid;

a bypass passage extending between the forward and rearward restrictor chambers for allowing hydraulic fluid between the chambers as the inner housing moves axially; and

an adjustable orifice in the bypass passage to selectively increase and decease the flow rate of the hydraulic fluid through the bypass passage.

4. The drill according to claim 1, wherein the pneumatic cylinder comprises:

an annular piston mounted to the inner housing for movement therewith and in sealing engagement with a portion of the bore of the outer housing, defining an annular pneumatic chamber; and

a port for delivering air pressure to the pneumatic chamber on one side of the pneumatic piston to cause the inner housing to move from one of the positions to the other of the positions.

5. The drill according to claim 1, wherein the pneumatic cylinder comprises:

an annular feed piston mounted to the inner housing for movement therewith and in sealing engagement with the bore of the outer housing, defining an annular feed chamber;

a feed port for delivering air pressure to the feed chamber to cause the inner housing to move to the extended position;

an annular retract piston mounted to the inner housing for movement therewith and in sealing engagement with the bore of the outer housing, defining an annular retract chamber; and

a retract port for delivering air pressure to the retract chamber to cause the inner housing to move to the retracted position.

6. The drill according to claim 1, further comprising:

a sensor assembly that provides a signal when the inner housing begins to move from the retracted position and also provides a signal when the inner housing reaches the extended position; and

a processor for receiving the signals and determining the amount of time between the signals.

7. The drill according to claim 1, further comprising:

a sensor assembly that provides a signal when the inner housing begins to move from the retracted position and also provides a signal when the inner housing reaches the extended position; and

a processor for receiving the signals, for determining the elapsed time between the signals, comparing the elapsed time to a predetermined reference, and providing an indication when the elapsed time determined exceeds the reference.

8. The drill according to claim 1, further comprising:

at least one dome member sealingly mounted within a cavity;

an electrical contact adjacent the dome member, the dome member being resilient and deflectable into engagement with the electrical contact;

an electronic circuit cooperatively engaged with the electrical contact for detecting when the electrical contact is engaged by the dome member; and

a pneumatic passage extending from the pneumatic cylinder assembly to the cavity for delivering air pressure to the cavity upon initial movement of the inner housing from the retracted position to cause the dome member to deflect into engagement with the contact.

9. The drill according to claim 1, further comprising:

a feed dome member and a retract dome member, each sealingly mounted within a cavity;

an electrical contact adjacent each of the dome members, each of the dome members being resilient and deflectable into engagement with the electrical contact;

an electronic circuit cooperatively engaged with the electrical contacts for detecting when the electrical contacts are engaged by the dome members;

a feed air passage extending from the pneumatic cylinder assembly to the cavity containing the feed dome member for delivering air pressure to the cavity containing the feed dome member upon initial movement of the inner housing from the retracted position, causing the feed dome member to deflect; and

a retract air passage extending from the pneumatic cylinder assembly to the cavity containing the retract dome member for delivering air pressure to the cavity containing the retract dome member when the inner housing reaches the extended position, causing the retract dome member to deflect.

10. The drill according to claim 1, further comprising:

a retract valve mounted to the outer housing;

a rod extending from the inner housing for movement therewith;

a contact plate mounted to the rod for contacting the retract valve at the completion of the extended position;

a retract passage leading from the retract valve to the pneumatic cylinder assembly; and wherein

the contact plate is adjustable along the rod to select a stroke length.

11. A drill, comprising:

a tubular outer housing having a bore extending along a longitudinal axis;

a tubular inner housing mounted in the bore for reciprocal movement along the axis between retracted and extended positions;

a pneumatic motor assembly having a chuck adapted to receive a drill bit for rotation therewith, the motor assembly being carried in the inner housing for axial movement therewith;

an annular feed piston extending around the inner housing for movement therewith and sealingly engaging the bore of the outer housing;

a feed air inlet for applying air pressure to a rearward side of the feed piston to cause the feed piston and the inner housing to move forward to the extended position;

annular forward and rearward restrictor chambers between the inner and the outer housing for containing hydraulic fluid;

a bypass passage extending between the forward and rearward restrictor chambers, the bypass passage having a variable orifice therein; and

wherein forward movement of the inner housing causes flow between the forward and rearward restrictor chambers through the bypass passage.

12. The drill according to claim 11, wherein a rearward end of the rearward restrictor chamber is defined by the feed piston, and forward movement of the feed piston causes flow of hydraulic fluid through the bypass passage.

13. The drill according to claim 11, further comprising an annular retract piston mounted to the inner housing rearward of the feed piston for movement therewith and sealingly engaging the bore, defining a retract chamber;

a retract air inlet for supplying air pressure to the retract chamber; and

a valve assembly for removing air pressure from the feed air inlet and causing air pressure to be supplied to the retract air inlet.

14. The drill according to claim 11, wherein the air pressure supplied to the feed air inlet is independent of air pressure supplied to the pneumatic motor assembly.

15. A drill, comprising:

a tubular outer housing having a bore extending along a longitudinal axis;

a tubular inner housing mounted in the bore for reciprocal movement along the axis between retracted and extended positions;

a pneumatic motor assembly having a chuck adapted to receive a drill bit for rotation therewith, the motor assembly being carried in the inner housing for axial movement therewith;

an annular feed piston extending around the inner housing for movement therewith and sealingly engaging the bore of the outer housing;

an annular feed chamber stationary seal fixed to the bore of the outer housing rearward of the feed piston, defining a feed chamber therebetween;

an annular retract piston extending around the inner housing for movement therewith rearward of the feed piston and sealingly engaging the bore of the outer housing, the retract piston having a smaller pressure area than the feed piston;

an annular retract chamber stationary seal fixed to the bore of the outer housing forward of the retract piston, defining a retract chamber therebetween; and

a pneumatic valve assembly for continually supplying air pressure to the retract chamber and for selectively supplying air pressure to the feed chamber to cause the feed piston to

move the inner housing forwardly, and for removing air pressure from the feed chamber to cause the retract piston to move the inner housing rearwardly.

16. The drill according to claim 15, wherein the valve assembly supplies air pressure to the feed chamber independent of air pressure supplied to the pneumatic motor assembly.

17. The drill according to claim 15, wherein the valve assembly comprises:

a shuttle valve having an open position for supplying air pressure to the feed chamber and a closed position that bleeds air pressure from the feed chamber.

18. The drill according to claim 15, wherein the valve assembly comprises:

a shuttle valve having a feed position for supplying air pressure to the feed chamber and a retract position that bleeds air pressure from the feed chamber, the shuttle valve having a feed pilot inlet and a retract pilot inlet;.

a normally closed feed valve that when manually opened supplies a pilot pressure pulse to the feed pilot inlet to cause the shuttle valve to move to the feed position;

a retract valve that when actuated delivers a pilot pulse to the retract pilot inlet to initiate movement of the shuttle valve to the retract position; and

a striker member mounted to the inner housing for contact with the retract valve when the inner housing reaches an end of a feed stroke.

19. The drill according to claim 15, further comprising an emergency valve incorporated with the valve assembly, that when manually depressed, bleeds air pressure from the feed

chamber to stop feed movement, the air pressure contained within the retract chamber thereby moving the inner housing to the retracted position.

20. A drill, comprising:

a tubular outer housing having a bore extending along a longitudinal axis;

a tubular inner housing mounted in the bore for reciprocal movement along the axis between retracted and extended positions;

a pneumatic motor assembly having a chuck adapted to receive a drill bit for rotation therewith, the motor assembly being carried in the inner housing for axial movement therewith;

an annular forward piston mounted to the inner housing for axial movement therewith and in sealing engagement with the bore of the outer housing;

a stationary forward seal fixed to the outer housing, sealingly engaging the inner housing and located rearward of the forward piston, defining an annular forward restrictor chamber therebetween for containing hydraulic fluid;

an annular feed piston mounted to the inner housing for axial movement therewith, in sealing engagement with the bore of the outer housing, and located rearward of the stationary seal, defining a rearward restrictor chamber therebetween for containing hydraulic fluid;

a pneumatic chamber located on the rearward side of the feed piston for moving the inner housing forward;

a bypass passage extending between the forward to the rearward restrictor chambers for allowing hydraulic fluid between the chambers as the inner housing moves forward; and

an adjustable orifice in the bypass passage to selectively increase and decease the flow rate of the hydraulic fluid through the bypass passage;

21. A drill, comprising:

a frame having a longitudinal axis;

a motor assembly having a chuck adapted to receive a drill bit for rotation therewith, the motor being carried by the frame for movement relative to the frame;

a pneumatic cylinder assembly mounted between the motor assembly and the frame for moving the motor assembly axially relative to the frame between extended and retracted positions;

a start feed dome member sealingly mounted within a start feed cavity of the drill;

a start feed electrical contact adjacent the start feed dome member, the start feed dome member being resilient and deflectable into engagement with the start feed electrical contact;

an electronic circuit cooperatively engaged with the start feed electrical contact for initiating a timer when the start feed electrical contact is engaged by the start feed dome member; and

a start feed pneumatic passage extending from the pneumatic cylinder assembly to the start feed cavity for delivering a start feed pulse of air pressure to the cavity upon initial movement of the motor assembly from the retracted position, the start feed pulse causing the start feed dome member to deflect.

22. The drill according to claim 20, further comprising:

a stop feed dome member sealingly mounted within a stop feed cavity of the drill;

a stop feed electrical contact adjacent the stop feed dome member, the stop feed dome member being resilient and deflectable into engagement with the electrical contact;

the electronic circuit being cooperatively engaged with the stop feed electrical contact for stopping the timer when the stop feed electrical contact is engaged by the stop feed dome member; and

a pneumatic passage extending from the pneumatic cylinder assembly to the stop feed cavity for delivering a stop feed pulse of air pressure to the cavity upon the motor assembly reaching the extended position, the stop feed pulse causing the stop feed dome member to deflect.

23. A method of drilling a hole in a workpiece, comprising:

mounting a tubular inner housing within a bore of a tubular outer housing;

mounting a motor assembly in the inner housing;

providing an annular pneumatic cylinder between the inner housing and the outer housing;

inserting a drill bit into a chuck of the motor assembly; and

supplying air pressure to the motor assembly to rotate the chuck and to the pneumatic cylinder to move the inner housing between the retracted and extended positions.

24. The method according to claim 23, further comprising:

providing forward and rearward sealed annular fluid restrictor chambers between the inner housing and the outer housing containing hydraulic fluid;

providing a bypass passage between the forward and rearward chambers;

while moving the inner housing forward, causing allowing hydraulic fluid to flow from the forward chamber through the bypass passage to the rearward chamber to limit the speed of the movement to the extended position; and

adjusting the flow rate of the hydraulic fluid through the bypass passage to select a desired speed.

25. A method of drilling a hole in a workpiece, comprising:

mounting a motor assembly to a frame;

mounting a pneumatic cylinder assembly between the motor assembly and the frame;

installing at least one the dome member within a cavity of a drill, the dome member being resilient and deflectable into engagement with an electrical contact;

connecting an electronic circuit with the electrical contact;

inserting a drill bit into a chuck of the motor assembly;

delivering air pressure to the pneumatic cylinder assembly to cause the motor assembly to rotate and to move the motor assembly from a retracted position to an extended position;

delivering a pulse of air pressure to the cavity upon initial movement of the motor assembly from the retracted position, causing the dome member to deflect into engagement with the contact; and

with the electronic circuit, detecting the engagement of the dome member with the contact.

26. A method of drilling a hole in a workpiece, comprising:

mounting a motor assembly to a frame;

mounting a pneumatic cylinder assembly between the motor assembly and the frame;

inserting a drill bit into a chuck of the motor assembly;

delivering air pressure to the pneumatic cylinder assembly to cause the motor assembly to rotate and to move the motor assembly from a retracted position to an extended position;

determining the elapsed time that it took for the motor assembly to move from the retracted position to the extended position;

comparing the elapsed time determined to a reference time; and

providing an indication if the elapsed time exceeds the reference time.

27. The method according to claim 26, further comprising:

recording a sequential number of cycles of movement of the motor assembly from the retracted to the extended positions.